

$^{14}\text{N}(\text{d},\alpha)$  **1965Sc12,1976Va07,1985Aj01**

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, J. E. Purcell and C. G. Sheu		NP A968, 71 (2017)	1-Jan-2017

- 1953Du23:  $^{14}\text{N}(\text{d},\alpha)$  E=620 keV, Measured  $E_\alpha$ ; deduced level energies,  $\Gamma$ .  
 1956Ah32: Deduced level energies.  
 1963Se23: E=1.8 MeV; Measured  $E_\alpha$ ,  $^{12}\text{C}$ - $\alpha$  coin. Deduced radiative width.  
 1964Ma53:  $^{14}\text{N}(\text{d},\alpha)$  E<sub>d</sub>=1.1-2.5 MeV, measured  $\alpha$ -spectrum,  $\sigma(E,\theta)$ .  
 1965Br08:  $^{14}\text{N}(\text{d},\alpha)$  E=5.93,7.17 MeV, measured  $\sigma(E_\alpha,\theta)$ .  $^{14}\text{N}(\text{d},\alpha\gamma)$  E=3-12 MeV, measured  $\sigma(E)$ .  
 1965St02:  $^{14}\text{N}(\text{d},\alpha)$  E=0.9-1.2 MeV, measured  $\sigma(E_\alpha)$ ,  $\sigma(E,E_\alpha,\theta)$ .  
 1965Wi11:  $^{14}\text{N}(\text{d},\alpha)$  E=0.717-1.740 MeV, measured  $\sigma(E,\theta)$ .  $^{12}\text{C}$  deduced L, J,  $\pi$ , level density.  
 1969Cu08:  $^{14}\text{N}(\text{d},\alpha)$  E=10-12 MeV, measured  $\sigma(E_\alpha,\theta)$ .  $^{12}\text{C}$  levels deduced L, J. Zero-range DWBA.  
 1969Go14:  $^{14}\text{N}(\text{d},\alpha)$  E=1-3.1 MeV, measured  $\sigma(E,\theta)$ ,  $\sigma(E,E_\alpha,\theta)$ .  
 1970Sc02:  $^{14}\text{N}(\text{d},\alpha)$  E=15,20 MeV, measured  $\sigma(E_\alpha,\theta)$ . Deduced optical model parameters.  $^{12}\text{C}$  deduced levels, J,  $\pi$ , S.  
 1971Ar41:  $^{14}\text{N}(\text{d},\alpha)$  E=1.7,2.3,2.9 MeV, measured  $\sigma(E_\alpha,\theta)$ .  
 1972Fa07:  $^{14}\text{N}(\text{d},\alpha')$  E=52,90 MeV, measured  $\sigma(E_\alpha,\theta)$ ,  $\alpha'\alpha$ -coin.  $^{12}\text{C}$  deduced levels, level-width, J,  $\pi$ .  
 1972Ne10:  $^{14}\text{N}(\text{d},\alpha)$  E=2.25-2.35 MeV, measured  $\sigma(E)$ .  
 1974Ba32:  $^{14}\text{N}(\text{d},\alpha)$  E=350,510,640 keV, measured  $\sigma(E,E_\alpha,\theta)$ . Deduced reaciton mechanism.  $^{12}\text{C}$  levels deduced relative  $\sigma$ .  
 1974Va15,1976Va07:  $^{14}\text{N}(\text{d},\alpha)$  E=40 MeV, measured  $\sigma(E_\alpha,\theta)$ .  $^{12}\text{C}$  deduced upper limit for isospin mixing, deduced levels, J,  $\pi$ .  
 1977Ko33:  $^{14}\text{N}(\text{d},\alpha)$  E=0.5-5.0 MeV, measured  $\sigma(E,\theta)$ .  
 1979De45:  $^{14}\text{N}(\text{pol. d},\alpha)$  E=1.5-3.0 MeV, measured A(E, $\theta$ ).  
 1982KaZS:  $^{14}\text{N}(\text{d},\alpha)$  E=18 MeV, measured  $\sigma(E_\alpha)$ , (particle)(particle)-coin,  $\sigma(\theta)$ .  $^{12}\text{C}$  deduced resonances, J,  $\pi$ , T, decay mode. DWBA analysis.  
 1995Hu15:  $^{14}\text{N}(\text{d},\alpha)$  E=2 MeV, measured  $E_\alpha$ ,  $I_\alpha$ .  
 1999Ig03:  $^{14}\text{N}(\text{d},\alpha\gamma)$  E=15.4 MeV, measured  $E_\gamma$ ,  $\sigma(\theta)$ , spin tensor density matrix.  
 2004Pe10:  $^{14}\text{N}(\text{d},\alpha)$  E=0.5-2 MeV, measured  $E_\alpha$ ,  $\sigma(E,\theta)$ .  
 2008Gu08:  $^{14}\text{N}(\text{d},\alpha)$  E=0.7-2.2 keV, measured excitation functions.  
 2017De25: XUNDL dataset Compiled by TUNL, 2018.

A beam of 10.5 MeV deuterons, from the INFN-LNS/Catania tandem, impinged on a  $\approx$ 40  $\mu\text{g}/\text{cm}^2$  melamine ( $\text{C}_3\text{H}_6\text{N}_6$ ) layer that was deposited on a  $\approx$ 10  $\mu\text{g}/\text{cm}^2$  carbon backing (private communication). A  $\Delta E$ -E telescope was positioned to measure and identify the  $\alpha$  particles resulting from  $^{14}\text{N}(\text{d},\alpha)$  reactions. On the opposite side of the beam, an 8 strip $\times$ 8 strip 2D position sensitive Si strip detector was positioned to effectively detect the  $3\alpha$  particles resulting from breakup of  $^{12}\text{C}^*(7654)$ ; hence a quadruple coincidence identified events of interest. A relatively background free peak was observed corresponding to  $^{12}\text{C}^*(7654)$ . An evaluation of the  $^{12}\text{C}^*(7.65 \text{ MeV})$  events using a Dailitz plot analysis and comparison with Monte Carlo simulations revealed the branching ratio for  $3\alpha$  Direct Decay is <0.043%. The direct  $3\alpha$  decay branch can be related to the astrophysical triple  $\alpha$  capture rate.

 $^{12}\text{C}$  Levels

E(level)	$J^\pi$	$\Gamma$	Comments
0			
$4.4 \times 10^3$	$2^+$		$J^\pi$ : From $\alpha$ - $\gamma$ studies.
$7.65 \times 10^3$			$\Gamma_{\text{rad}}/\Gamma = (\Gamma_\gamma + \Gamma_\pi)/\Gamma = 2.8 \times 10^{-4}$ 3 (1963Se23). E(level): Also see $E_x = 7690 \text{ keV}$ 33 from $\Delta E(0^+ \geq 2^+) = 3251 \text{ keV}$ 33 (1953Du23).
9642 14	30 keV 8		E(level): In (2017De25), the branching ratio for $3\alpha$ Direct Decay is found as <0.043%, this can be related to the astrophysical triple $\alpha$ capture rate.
$10.84 \times 10^3$			E(level): From (1956Do41).
$11.83 \times 10^3$			$\Gamma$ : From (1953Du23,1956Ah32).
12700 70			E(level): See (1965Br08,1970Sc02).
$13.29 \times 10^3$	355 keV 50		E(level): See (1965Br08,1970Sc02).
			E(level): From (1965Pe17).
			E(level), $\Gamma$ : From (1965Sc12).

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**$^{14}\text{N}(\text{d},\alpha)$     1965Sc12,1976Va07,1985Aj01 (continued)**

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**$^{12}\text{C}$  Levels (continued)**

E(level)	J <sup>π</sup>	Γ	Comments
$14.08 \times 10^3$			
$15.11 \times 10^3$			
$19.50 \times 10^3$	$I0$	$(1,2,3)^+$	$\approx 250$ keV E(level): See ( <a href="#">1965Br08</a> ). T=0
$20.55 \times 10^3$	$I0$	$(2,3)^+$	$\approx 200$ keV E(level),J <sup>π</sup> ,Γ: From ( <a href="#">1976Va07</a> ). T=0
$22.5 \times 10^3$	$I$	$(2,3)^+$	$\approx 750$ keV E(level),J <sup>π</sup> ,Γ: From ( <a href="#">1976Va07</a> ). Possibly unresolved states.
$23.9 \times 10^3$	$I$		$\approx 400$ keV E(level),Γ: From ( <a href="#">1976Va07</a> ).

**$\gamma(^{12}\text{C})$**

E <sub>γ</sub>	E <sub>i</sub> (level)	J <sub>i</sub> <sup>π</sup>	E <sub>f</sub>
$4.44 \times 10^3$	$4.4 \times 10^3$	$2^+$	0

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**Level Scheme**

